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PATENT & TRADEMARK OFFICE

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Practitioner's Docket No. 712-002.104/CC-0166 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Michael A. Davis et al.
Application No.: 09 /703,823 Group No.: 2877
Filed: November 1, 2000 Examiner: Michael A. Lyons
For: Official System Featuring Chirped Bragg Grating Etalon For Providing Precise Reference Wavelengths

Mail Stop Appeal Briefs – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF/ APPEAL BRIEF
(PATENT APPLICATION—37 C.F.R. § 1.192)

NOTE: The phrase "the date on which" an "appeal was taken" in 35 U.S.C. 154(b)(1)(A)(ii) (which provides an adjustment of patent term if there is a delay on the part of the Office to respond within 4 months after an "appeal was taken") means the date on which an appeal brief under § 1.192 (and not a notice of appeal) was filed. Compliance with § 1.192 requires that: 1. the appeal brief fee (§ 1.17(c)) be paid (§ 1.192(a)); and 2.the appeal brief complies with § 1.192(c)(1) through (c)(9). See Notice of September 18, 2000, 65 Fed. Reg. 56366, 56385-56387 (Comment 38).

1. Transmitted herewith, in triplicate, is the APPEAL ~~BRIEF~~ in this application, with respect to the Notice of Appeal filed on December 10, 2003.

NOTE: "Appellant must, within two months from the date of the notice of appeal under § 1.191 or within the time allowed for reply to the action from which the appeal was taken, if such time is later, file a brief in triplicate. . . " 37 C.F.R. § 1.192(a) (emphasis added).

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*
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Date: 16 November 2005

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William J. Barber
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** Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.*

11/22/2005 DTESSEM1 00000004 230442 09703823
02 FC:1251 120.00 DA

2. STATUS OF APPLICANT

This application is on behalf of

- [X] other than a small entity.
- [ ] a small entity.

  A statement:

  - [ ] is attached.
  - [ ] was already filed.

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:

[ ]	small entity	$165.00
[ ]	other than a small entity	$330.00

/**Appeal Brief fee due $ 0.00***

4. EXTENSION OF TERM

NOTE: *37 C.F.R. § 1.704(b) ". . .an applicant shall be deemed to have failed to engage in reasonable efforts to conclude processing or examination of an application for the cumulative total of any periods of time in excess of three months that are taken to reply to any notice or action by the Office making any rejection, objection, argument, or other request, measuring such three-month period from the date the notice or action was mailed or given to the applicant, in which case the period of adjustment set forth in § 1.703 shall be reduced by the number of days, if any, beginning on the day after the date that is three months after the date of mailing or transmission of the Office communication notifying the applicant of the rejection, objection, argument, or other request and ending on the date the reply was filed. The period, or shortened statutory period, for reply that is set in the Office action or notice has no effect on the three-month period set forth in this paragraph."*

NOTE: *The time periods set forth in 37 C.F.R. § 1.192(a) are subject to the provision of § 1.136 for patent applications. 37 C.F.R. § 1.191(d). See also Notice of November 5, 1985 (1060 O.G. 27).*

NOTE: *As the two-month period set in § 1.192(a) for filing an appeal brief is not subject to the six-month maximum period specified in 35 U.S.C. § 133, the period for filing an appeal brief may be extended up to seven months. 62 Fed. Reg. 53,131, at 53,156; 1203 O.G. 63, at 84 (Oct. 10, 1997).*

The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136 apply.

(complete (a) or (b), as applicable)

(a) [X] Applicant petitions for an extension of time under 37 C.F.R. § 1.136 (fees: 37 C.F.R. § 1.17(a)(1)-(5)) for the total number of months checked below:

Extension (months)	Fee for other than small entity	Fee for small entity
[X] one month	$ 110.00	$ 55.00
[ ] two months	$ 420.00	$ 210.00
[ ] three months	$ 950.00	$ 475.00
[ ] four months	$ 1,480.00	$ 740.00
[ ] five months	$ 2,010.00	$ 1,005.00

Fee: $________

*** PREVIOUSLY SUBMITTED**

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for ______ months has already been secured, and the fee paid therefor of $______________ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request $______________

or

(b) ☒ Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE

The total fee due is:

~~Appeal brief fee~~ /Supplemental $ 0.00

Extension fee (if any) $______________

TOTAL FEE DUE $ 0.00

6. FEE PAYMENT

☐ Attached is a ☐ check ☐ money order in the amount of $______________

☐ Authorization is hereby made to charge the amount of $______________

☐ to Deposit Account No. ______________

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☐ Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

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7. FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to change the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, *1065 O.G. 31-33.*

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SIGNATURE OF PRACTITIONER

Date:

William J. Barber

(type or print name of practitioner)

Reg. No.: 32,720

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PATENT
File No.: 712-002-104/CC-0166

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re application of: Michael A. Davis et al.

Serial No.: 09/703,823 : Examiner: Michael A. Lyons

Filed: November 1, 2000 : Group Art Unit: 2877

For: OPTICAL SYSTEM FEATURING CHIRPED BRAGG GRATING ETALON FOR PROVIDING PRECISE REFERENCE WAVELENGTHS

MAIL STOP APPEAL BRIEFS; PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

BRIEF FOR APPELLANTS

Sir:

This is a Brief for Appellants submitted in response to a Notice of Non-Compliance mailed September 16, 2005.[1]

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1 I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner for Patents, Alexandria, VA 22313-1450.

William J. Barber | Date: 16 NOV. '05

Procedural Summary

As a procedural summary, a notice of appeal was submitted on December 8, 2003[2] in response to an Official Action mailed August 7, 2003, made final, including an Advisory Action mailed October 28, 2003. On February 10, 2004, Applicants submitted an Appeal Brief, the subject matter of which is hereby incorporated by reference in its entirety. On April 20, 2004, the Patent Office mailed a new Office Action, made final, reopening the prosecution. On July 20, 2004, a Request for Reinstatement of the Appeal and Supplemental Brief was submitted in response to the new points made in April 20th Office Action, the subject matter of which is also hereby incorporated by reference in its entirety. On September 16, 2005, the Notice of Non-Compliance mailed. This new Brief for Appellants is in response to the September 16th Notice of Non-Compliance and is a combination of the February 10th Appeal Brief and the July 20th Request for Reinstatement of the Appeal and Supplemental Brief.

This Brief for Appellants is being filed in triplicate in accordance with 37 CFR §1.17(c). No additional fee is being submitted; however, in the event a further fee is needed, the commissioner is hereby authorized to charge deposit account no.

[2] The Notice of Appeal was mailed on December 8, 2003 with a return receipt postcard. The Patent Office stamped and mailed the return receipt postcard back to applicants on December 10, 2003.

23-0442 for whatever fees are necessary to submit this Brief for Appellant.

I. THE REAL PARTY IN INTEREST

The real party in interest is CiDRA Corporation, of Wallingford, Connecticut, a corporation of the State of Delaware, doing business at 50 Barnes Park North, Wallingford, CT 06492.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

III. STATUS OF CLAIMS

Independent claims 1 - 20 are pending, stand rejected, and are being appealed.

IV. STATUS OF AMENDMENTS

No amendment was filed subsequent to the August 7th final rejection.

V. SUMMARY OF THE INVENTION

1. The Problem In The Art

Pages 1-2 of the patent application set forth the problem in the art being addressed by the claimed invention. In summary, the use of an etalon formed by broadband fiber Bragg grating pairs as shown in Figure 1 of the patent application results in a very limited set of resonant frequencies, as described in the patent application on page 2, line 20, through page 3, line 3. For example, if a resonant optical frequency is outside a very limited region, the light will pass through the fiber Bragg grating etalon cavity unaffected. For a set of reference optical frequencies, the unaffected light is most undesirable and would merely result in the provision of a very limited spectrum of optical reference signals. The use of a multiplicity of etalons formed from a series of broadband fiber Bragg grating pairs in order to overcome this problem raises a whole different set of problems, including issues related to the differing temperature sensitivities of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs.

2. The Claimed Solution

The inventors recognized the aforementioned problem in the art and provided a solution to the same. To solve this problem, the inventors designed an optical system featuring a chirped

Bragg grating etalon that responds to the broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals, as recited in claim 1. The precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source with the power at the beginning and end of the spectrum of the broadband source passed substantially unaffected by the chirped Bragg grating etalon, as recited in dependent claim 20 (See also dependent claim 4).

In effect, the whole thrust of the claimed invention is to use a broadband source in combination with a chirped Bragg grating etalon in order to provide a precise set of optical reference signals having a broad spectrum of frequencies of interest. As a person skilled in the art would appreciate, the use of the chirped Bragg grating etalon to provide the desired series of peaks covering most of the source spectral width of the broadband source substantially eliminates the differing temperature sensitivities problem that might otherwise occur with the use of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs like that of the prior art shown in Figure 1 of the patent application.

VI. ISSUE

The following issue will be addressed in the Argument:

The non-obviousness of claims 1-20 over Kringlebotn (United States Patent No. 6,097,487) in view of Farhadiroushan (United States Patent No. 5,754,293), and further in view of Galvanauskas et al. (United States Patent No. 5,499,134).

VII. GROUPING OF THE CLAIMS

Claims 1, 4 and 20 are argued separately, and claims 2-3 and 5-19 stand or fall in relation to claim 1.

VIII. ARGUMENTS

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kringlebotn (United States Patent No. 6,097,487) in view of Farhadiroushan (United States Patent No. 5,754,293) and further in view of Galvanauskas et al. (United States Patent No. 5,499,134).

The Traversal

It is respectfully submitted that the proposed combination of Kringlebotn in view of Farhadiroushan and Galvanauskas et al. does not teach or suggest an optical system featuring a chirped Bragg grating etalon that responds to a broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals, as recited in claim 1.

Moreover, it is respectfully submitted that the prior art does not suggest why one of ordinary skill in the art would be motivated first to combine features of Kringlebotn's optical measuring device with features of Farhadiroushan's sensing device, then further modify the proposed combination by substituting Galvanauskas et al.' chirped Bragg gratings for Farhadiroushan's non-chirped inline fiber Bragg grating pairs, in order to end up with the claimed optical system for providing a precise set of reference signals, especially to solve the problem in the art being addressed by the inventors related to the use of broadband fiber Bragg grating pairs for providing such precise reference signals. None of the cited references even recognize the problem being solved by the inventors or suggest a solution thereto.

Kringlebotn discloses a wavelength measurement device for measuring Bragg grating wavelengths of several multiplexed FBGs,

as described in column 4, line 37, to column 5, line 9. The wavelength measurement device includes a broadband source 1 and tunable F-P filter 2 for providing a tunable broadband signal to a directional coupler 4 having two optical fibers attached thereto. One optical fiber has fiber Bragg gratings 6 having wavelengths $\cdot_{1}$, $\cdot_{2}$, $\cdot_{3}$, while the other optical fiber has at least one fiber Bragg grating 5 with a known wavelength having wavelengths $\cdot_{ref}$, and other fiber Bragg gratings $\cdot_{4}$, $\cdot_{5}$. In operation, the reflected light from the FBGs, occurring in time when the wavelength of the narrowband filter source light matches the Bragg wavelengths of the FBGs, is directed through a directional coupler 4 onto a detector 7 which converts the optical signal to an electrical pulse train as illustrated, with each pulse representing the individual Bragg wavelengths of the FBGs with one pulse representing $\cdot_{ref}$.

It is respectfully submitted that Kringlebotn does not teach or suggest that its fiber Bragg gratings having different wavelengths $\cdot_{1}$, $\cdot_{2}$, $\cdot_{3}$, $\cdot_{ref}$, $\cdot_{4}$, $\cdot_{5}$ are a chirped Bragg grating etalon, as claimed herein. Kringlebotn's fiber Bragg gratings having different wavelengths $\cdot_{1}$, $\cdot_{2}$, $\cdot_{3}$, $\cdot_{ref}$, $\cdot_{4}$, $\cdot_{5}$ are not a pair of identical fiber Bragg gratings as the term is known and used in the art.[3] Moreover, Kringlebotn does not teach or suggest

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[3] It is respectfully submitted that a person skilled in the art would appreciate that an etalon configuration has two identical Bragg gratings (i.e. having identical wavelengths) in a

that its fiber Bragg gratings respond to the broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of the optical reference signals, as claimed herein. Clearly, the graph in Figure 1 has a time based output showing the different fiber Bragg grating wavelengths $\cdot_1$, $\cdot_2$, $\cdot_3$, $\cdot_{ref}$, $\cdot_4$, $\cdot_5$ over different times. Finally, Kringlebotn neither recognizes nor suggests a solution to the problem related to using broadband fiber Bragg grating pairs for providing precise reference signals, which is the problem being addressed and solved by the claimed invention. This is no surprise since the whole thrust of Kringlebotn's disclosure relates to a measuring device.

The reasoning on page 2 of the Final Rejection recognizes that Kringlebotn does not teach or suggest either the use of an etalon or a chirped Bragg grating etalon as these terms are known and used in the art. In order to make up for this deficiency, the reasoning is pointing to Farhadiroushan and Galvanauskas et al. to fill the gaps.

However, in summary, it is respectfully submitted that neither Farhadiroushan nor Galvanauskas et al. suggests the use of a chirped Bragg grating etalon in combination with a broadband

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series in an optical fiber. In operation, optical light having the wavelength of the Bragg grating pair reflects back and forth between the identical Bragg grating pair. Enclosed is page 261 (Exhibit A) from "Fiber Bragg Gratings", by Othonos et al, which defines an etalon.

optical source to solve the problem being address by the inventors. Further, neither Farhadiroushan nor Galvanauskas et al. suggests the use of a chirped Bragg grating etalon in combination with a broadband optical source to provide a precise set of optical reference signals, especially having a series of peaks covering most of a source spectral width of the broadband source with the power at the beginning and end of the spectrum of the broadband source passed substantially unaffected by the chirped Bragg grating etalon, as recited in dependent claim 20.

For example, Farhadiroushan discloses an optical sensor system having a series of sensing interferometers 10, each with a respective specific wavelength $\cdot_1$, $\cdot_2$, ..., $\cdot_n$. Each sensing interferometers 10 is formed by an in-line fiber Bragg grating pair that provide a single separate wavelength of interest. Clearly, Farhadiroushan's sensing interferometers 10 are not formed from chirped Bragg gratings, as claimed herein, so the reasoning in the Final Rejection is pointing to Galvanauskas et al. to fill this void.

It is respectfully submitted that Farhadiroushan merely discloses a sensing device, and neither recognizes problems related to designing an optical system for providing a set of optical reference signals, nor provides suggestions about solutions related to such optical system designs for providing a set of optical reference signals, including the use of a chirped

Bragg grating etalon to solve the "broadband grating" problem being addressed by the instant inventors for providing the same. In view of this, it is not clear on the record as a whole why one of ordinary skill would be motivated to even look to Farhadiroushan's teaching related to a sensing device to solve the problem related to providing a set of reference signals like that being addressed by the instant inventors.

Galvanauskas et al. merely discloses the use of a system having a chirped fiber Bragg grating. Galvanauskas et al. neither recognizes problems related to designing an optical system for providing a set of optical reference signals, nor provides suggestions about solutions related to such optical system designs for providing a set of optical reference signals, including the use of a chirped Bragg grating etalon to solve the "broadband grating" problem being addressed by the instant inventors for providing the same. In view of this, it is not clear on the record as a whole why one of ordinary skill would be motivated to even look to Galvanauskas et al.' teaching related to a chirped grating to solve the problem related to providing a set of reference signals like that being addressed by the instant inventors.

The Federal Circuit has clearly announced that, when an obviousness determination is based on multiple prior art references, there must be a showing of some " teaching,

suggestion, or reason" to combine the cited references. *Winner International Royalty Corp. v. Wang*, 202 F.3d 1340, 1348, 53 USPQ 2d 1850, 1585 (Fed. Cir.) cert. denied, 530 US 1238 (2000). The Federal Circuit further instructs that " [t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, 972 F.2d 1260, 1266 Note.14 23 USPQ 2d 1780, 1783-84 N.14 (Fed. Cir. 1992) *citing In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). It is further established that " such a suggestion may come from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to the problem." *Pro-Mold & Toolco v. Great Lakes Plastics, Inc.*, 75 F.3d 1568-1573, 37 USPQ 2d 1626, 1630 (Fed. Cir. 1996), *citing In re Rinehart*, 531 F.2d 1048-1054, 189 USPQ 143, 149 (CCPA 1976) considering the problem to be solved in a determination of obviousness. The Federal Circuit reasons in *Para-Ordnance Mfg. v. SGS Importers International Inc.*, 73 F.3d, 1085, 1088-89, 37 USPQ 2d 1237-1239-40 (Fed. Cir. 1995), *cert. denied*, 519 US 822 (1996) for the determination of obviousness, that the Court must answer whether one of ordinary skill in the art who sets out to solve the problem and who had before him in his workshop the prior art, would have been reasonably expected to use the solution that is claimed by the Appellant. However,

" [o]bviousness may not be established using hindsight or in view of the teachings or suggestion of the invention" . In addition, the Federal Circuit requires the Patent and Trademark Office to make specific findings on a suggestion to combine prior art references. *In re Dembiczak*, 175 F.3d 994, 1000-01, 50 USPQ 2d 1614, 1617-19 (Fed. Cir. 1999). " The combination of elements from non-analogous sources, in a manner that reconstructs the applicant's invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness." *Oetiker*, 977 F.2d at 1445, 24 USPQ 2d at 1446.

It is respectfully submitted that the proposed combination involving both a combination and substitution/modification is not proper under the case law announced by the Federal Circuit, because nothing in either cited reference, or anything else on the record as a whole for that matter, suggests either to make such a combination then a subsequent substitution/modification, or a reason why one of ordinary skill in the art would be motivated to do the same to solve the problem being addressed by the instant inventors. In view of this, the Examiner has failed to establish a *prima facie* case of unpatentability with respect to all of these claims and, in particular, with respect to claims 1 and 20.

For instance, in the proposed combination a single one of the multiplicity of Farhadiroushan's non-chirped inline fiber

Bragg grating pairs from the sensing interferometers 10 is being substituted for a single one of the multiplicity of fiber Bragg gratings 6 shown in Figure 1 of Kringlebotn. (The remaining multiplicity of fiber Bragg gratings 6 shown in Figure 1 of Kringlebotn are apparently not being used.) However, nothing in the three cited reference suggests either to make such a first combination, or a reason why one of ordinary skill in the art would be motivated to make the same to solve the problem being addressed by the instant inventors. Further, clearly this proposed combination does not result in the claimed invention.

Because of this, in the proposed combination a single chirped Bragg grating etalon is next being substituted for Farhadiroushan's single non-chirped inline fiber Bragg grating pair in order to provide the claimed precise set of optical reference signals. However, for reasons set forth in the patent application on pages 1-2, the use of a chirped Bragg grating etalon configuration in the manner recited in the claimed invention provides an important contribution to the state of the art, the need or provision of which not recognized by the prior art and thus would not be obvious to one of ordinary skill in the art. For example, pages 1-2 of the patent application set forth the problem in the art being addressed by the inventors of the claimed invention. In summary, the use of an etalon formed by broadband fiber Bragg grating pairs as shown in Figure 1 of the

patent application results in a very limited set of resonant frequencies, as described in the patent application on page 2, line 20, through page 3, line 3. For example, if a resonant optical frequency is outside a very limited region, the light will pass through the fiber Bragg grating etalon cavity unaffected. For a set of reference optical frequencies, the unaffected light is most undesirable and would merely result in the provision of a very limited spectrum of optical reference signals. The use of a multiplicity of etalons formed from a series of broadband fiber Bragg grating pairs in order to overcome this problem raises a whole different set of problems, including issues related to the differing temperature sensitivities of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs.

The inventors first recognized this problem in the art and provided a solution to the same. To solve this problem, the inventors designed an optical system featuring a chirped Bragg grating etalon that responds to a broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals, as recited in claim 1. The precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source with the power at the beginning and end of the spectrum of the broadband source passed substantially unaffected

by the chirped Bragg grating etalon, as recited in dependent claim 20.

In effect, the whole thrust of the claimed invention is to use a broadband source in combination with a single chirped Bragg grating etalon in order to provide a precise set of optical reference signals having a broad spectrum of frequencies of interest. As a person skilled in the art would appreciate, the use of the chirped Bragg grating etalon to provide the desired series of peaks covering most of the source spectral width of the broadband source substantially eliminates the differing temperature sensitivities problem that might otherwise occur with the use of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs like that of the prior art shown in Figure 1 of the patent application.

It is respectfully submitted that none of the cited prior art references, or any other prior art on the record, either recognizes the aforementioned problem in the art, or even remotely suggests a solution thereto, especially the use of a Bragg grating chirped etalon to solve the same. For all these reasons, the prior art does not teach or suggest the further substitution of chirped bragg gratings in place of the pair of FBGs shown and described in <u>Farhadiroushan</u> so as to form the chirped fiber Bragg grating etalon configuration, as claimed herein.

In conclusion, in the absence of that shown and described in the instant patent application, nothing in the cited references suggests either to make such a second substitution/modification, or a reason why one of ordinary skill in the art would be motivated to do the same to solve the problem being addressed by the instant inventors. For all these reasons, it is respectfully submitted that the proposed combination and substitution/modification is not proper under the Patent laws and smacks of hindsight reconstruction after the Patent Office has had the benefit of reading the instant patent application.

Dependent Claims 2-15

Claims 2-15 and 20 depend from claim 1, contain all the limitations therein, and are deemed patentable over the cited prior art for the reasons set forth above.

Claims 16-19

For substantially similar reasons, claims 16-19 are deemed patentable over the proposed combination.

Response to the Points Made on Pages 5-8 of the Final Rejection

The whole thrust of the claimed invention is to provide an optical system that uses a chirped etalon that responds to a broadband signal for providing multiple precise reference signals

that include multiple spikes as shown in Figures 4a, 5b, etc. of the instant patent application.

In the Final Rejection, the reasoning states on page 3, sole paragraph, that the abstract and column 4, lines 49-50 of the specification are "leaving open the possibility that the reference grating [element 5 in Figure 1] is comprised of a plurality of Bragg gratings." However, in response thereto, it is respectfully submitted that this reasoning completely overlooks the fact that, in addition to that shown in Figure 1, Kringlebotn also discloses a measuring device either using multiple gratings having the same wavelength in Figure 4 (which is clearly based on the device in Figure 1), or using multiple gratings having different wavelengths in Figure 5 (which is also clearly based on the device in Figure 1), as described in Kringlebotn, column 5, line 33, through column 5, line 10. In operation, each grating in Kringlebotn provides one reference signal with one spike.

Moreover, the reasoning in the Final Rejection also overlooks the fact that Farhadiroushan merely discloses a sensing device using multiple etalons having different wavelengths, each etalon formed by a respective grating pair with the same wavelength, for sensing a parameter at different locations. In operation, each etalon in Farhadiroushan provides one reference signal, i.e. one spike, similar to Kringlebotn.

In view of this similarly, it is respectfully submitted that, clearly, Kringlebotn and Farhadiroushan both use either one grating for providing one reference signal, or one etalon for providing one reference signal. **In addition, and in complete contrast, clearly neither Kringlebotn nor Farhadiroushan discloses or even remotely suggests either using one grating for providing multiple precise reference signals, or using one etalon for providing multiple precise reference signals, which is the whole thrust of the claimed invention.** It is respectfully submitted that the reasoning in the Final Rejection completely overlooks this fundamental deficiency in the teaching of the Kringlebotn/Farhadiroushan proposed combination.

For this reason, the Kringlebotn/Farhadiroushan proposed combination simply cannot result in the claimed invention, even if one were motivated to combine and/or modify these two references in the manner proposed. In comparison, the claimed optical system is able to provide multiple precise reference signals from such an etalon structure because it has a chirped etalon. **Clearly, neither Kringlebotn nor Farhadiroushan even remotely suggests using such an etalon structure to provide such multiple precise reference signals, as claimed herein.**

Furthermore, there is clearly no motivation to combine Kringlebotn and Farhadiroushan in the manner proposed, because Farhadiroushan **expressly teaches** away from using one etalon for

providing multiple reference signals, instead teaching to use a plurality of etalons each having a different respective wavelength for sensing a parameter at different locations. In other words, each etalon is spatially separated at a different location in order to separately sense a parameter at each different location.

Nevertheless, the reasoning in the Final Rejection looks to further modify the Kringlebotn/Farhadiroushan proposed combination by substituting Galvanauskas' chirped gratings for the gratings already in Farhadiroushan's etalon. The reasoning in the Final Rejection, page 4, paragraph 2, incorrectly bases this proposed substitution, modification and/or combination on some perceived need "to better facilitate the passage of a spectrum of wavelengths through the etalon as per the claimed invention for a reference measurement, as the use of chirped Bragg gratings offer 'unprecedented compactness, robustness, and system efficiency'", citing Galvanauskas' abstract, lines 7-8. However, it is respectfully submitted that one of ordinary skill in the art would not be motivated or desire to modify the Kringlebotn/Farhadiroushan proposed combination in this manner because one would not be motivated or desire to sense or measure multiple reference signals at Farhadiroushan's or Kringlebotn's different sensing or measuring locations using an etalon having Galvanauskas' chirped grating. The reasoning in the Final

Rejection completely overlooks this fact. Because of this, the reasoning in support of this substitution, modification and/or combination of the Kringlebotn/Farhadiroushan proposed combination is nothing more than hindsight reconstruction after the Patent Office has had the benefit of reading Applicants' patent application.

For all these reasons, it is respectfully submitted that the Kringlebotn/Farhadiroushan/Galvanauskas proposed combination does not, and cannot, result in the claimed invention, and that one of ordinary skill in the art would not be motivated or desire to combine and modify the subject matter of these three cited references in the manner proposed. It is respectfully submitted that the reasoning in the Final Rejection overlooks this fundamental deficiency in the reasoning that supports the Kringlebotn/Farhadiroushan/Galvanauskas proposed combination.

The Point on Page 7, Second Paragraph

Furthermore, the point on page 7, second paragraph, states that claims 4 and 20 are not argued separately. In response thereto, it is respectfully submitted that, claim 4 recites an optical system according to claim 1, wherein the precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broad optical source signal with the power at the beginning and end of the spectrum

passed unaffected by the chirped Bragg grating etalon due to the limited bandwidth thereof; while claim 20 recites an optical source according to claim 1, wherein the precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source; and the broadband source has a spectrum and the power at the beginning and end of the spectrum is passed substantially unaffected by the chirped Bragg grating etalon.

The reasoning in the Final Rejection points to Galvanauskas for teaching a chirped grating. However, consistent with that set forth above, it is respectfully submitted that Galvanauskas neither teaches or suggests the features of the claimed invention set forth in claim 4 and 20, nor would one of ordinary skill in the art be motivated or desire to combine the selective teaching of Galvanauskas with the Kringlebotn/Farhadiroushan combination in the manner proposed. For example, Galvanauskas does not even remotely suggest to use a chirped grating in the manner set forth in claims 4 and 20, especially to solve the problem in the art being addressed by the inventors. Clearly, Kringlebotn and Farhadiroushan are totally silent on this issue as well. It is respectfully submitted that the reasoning in the April 20th Office Action completely overlooks this fact, and does not look at Galvanauskas' **teaching as a whole.**

The Point on Page 7, Third Paragraph

In response to the point on page 7, third paragraph, and consistent with that discussed above, it is respectfully submitted that Kringlebotn clearly discloses that the measuring device either uses multiple gratings having the same wavelength in Figure 4 (which is based on the device in Figure 1), or uses multiple gratings having different wavelengths in Figure 5 (which is also based on the device in Figure 1), as described in Kringlebotn, column 5, line 33, through column 5, line 10. In operation, each grating in Kringlebotn provides one reference signal with one spike. It is respectfully submitted that the reasoning in the April 20th Office Action completely overlooks Kringlebotn's **teaching as a whole**, including the fact that Kringlebotn discloses devices using multiple gratings in Figures 4-5, instead choosing to rely on the Kringlebotn device in Figure 1 that only uses a single grating 5, which has nothing whatsoever to do with the whole thrust of the claimed invention.

The Point on Page 8, First Paragraph

In response to the points on page 8, first and second paragraphs, and consistent with that discussed above, it is respectfully submitted that, clearly, Kringlebotn and Farhadiroushan both use either one grating for providing one reference signal, or one etalon for providing one reference

signal. **In addition, and in complete contrast, clearly neither Kringlebotn nor Farhadiroushan discloses or suggests either using one grating for providing multiple precise reference signals, or using one etalon for providing multiple precise reference signals, which is the whole thrust of the claimed invention.** In view of this, it is respectfully submitted that any such substitution and/or modification of Farhadiroushan's etalon for Kringlebotn's reference Bragg grating does not result in **using one grating for providing multiple precise reference signals, or using one etalon for providing multiple precise reference signals, which is again the whole thrust of the claimed invention.** There is still an important piece of the claimed invention that is still missing and must somehow be filled in.

Galvanauskas' teaching **as a whole** does not make up for the fundamental deficiency in the teaching of the Kringlebotn/Farhadiroushan proposed combination in relation to this missing piece of the claimed invention. For example, as discussed in Applicants' February 10th Appeal Brief, pages 3-4, the use of an etalon formed by broadband fiber Bragg grating pairs as shown in Figure 1 of the patent application results in a very limited set of resonant frequencies, as described in the patent application on page 2, line 20, through page 3, line 3. For example, if a resonant optical frequency is outside a very limited region, the light will pass through the fiber Bragg

grating etalon cavity unaffected. For a set of reference optical frequencies, the unaffected light is most undesirable and would merely result in the provision of a very limited spectrum of optical reference signals. The use of a multiplicity of etalons formed from a series of broadband fiber Bragg grating pairs in order to overcome this problem raises a whole different set of problems, including issues related to the differing temperature sensitivities of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs.

Clearly, Galvanauskas' does not recognize this problem in the art, or even remotely suggest a solution to the same.

Instead, the inventors were the first to recognized the aforementioned problem in the art and provided said solution to the same. To solve this problem, the inventors designed an optical system featuring a chirped Bragg grating etalon that responds to the broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals, as recited in claim 1. The precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source with the power at the beginning and end of the spectrum of the broadband source passed substantially unaffected by the chirped Bragg grating etalon, as recited in dependent claim 20 (See also dependent claim 4).

In effect, the whole thrust of the claimed invention is to use a broadband source in combination with a chirped Bragg grating etalon in order to provide a precise set of optical reference signals having a broad spectrum of frequencies of interest. As a person skilled in the art would appreciate, the use of the chirped Bragg grating etalon to provide the desired series of peaks covering most of the source spectral width of the broadband source substantially eliminates the differing temperature sensitivities problem that might otherwise occur with the use of the multiplicity of etalons formed from the broadband fiber Bragg grating pairs like that of the prior art shown in Figure 1 of the patent application.

Nothing in Farhadiroushan, Kringlebotn, Galvanauskas, alone or in combination, or anything else on the record for that matter, even remotely suggests combining the teaching of these references to solve the aforementioned problem. In complete contrast, neither Farhadiroushan, Kringlebotn, Galvanauskas even remotely recognizes this problem in the art. Instead, the reasoning in the April 20th Office Action is piecing together selective teachings from the different cited references, and overlooking the teaching of each reference **as a whole.**

In view of this, it is respectfully submitted that only the present patent application provides the motivation or desire to combine, substitute and/or modify the teaching of Farhadiroushan,

Kringlebotn, Galvanauskas in the manner proposed, which smacks of hindsight reconstruction.

Conclusion

It is respectfully submitted that the proposed combination of Kringlebotn in view of Farhadiroushan and further in view of Galvanauskas does not teach or suggest an optical system featuring a chirped Bragg grating etalon that responds to a broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals, as recited in claim 1. Moreover, it is respectfully submitted that the prior art does not even remotely suggest why one of ordinary skill in the art would be motivated first to combine features of Kringlebotn's optical measuring device with features of Farhadiroushan's sensing device, then further modify the proposed combination by substituting Galvanauskas et al.' chirped Bragg gratings for Farhadiroushan's non-chirped inline fiber Bragg grating pairs, in order to end up with the claimed optical system for providing a precise set of reference signals, especially to solve the problem in the art being addressed by the inventors related to the use of broadband fiber Bragg grating pairs for providing such precise reference signals. None of the cited references even recognize the problem being solved by the inventors or suggest a solution thereto. Instead, the reasoning

in the Final Rejection is completely overlooking the teaching of the cited references **as a whole**, and piecing together selective parts of different references that neither recognizes the problem that needed to be solved in the prior art, or even remotely suggests the solution provided by the Applicants' with the claimed invention. In view of this, it is respectfully submitted that the reasoning in the Final Rejection rejecting claims 1-20 is in error, and should be reversed.

Conclusion

In view of this, it is respectfully submitted that the reasoning in the rejection of these claims is in error, and should be reversed.

Respectfully submitted,

William J. Barber
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Registration No. 32,720

WJB/dap
November 16, 2005
Enclosures: Exhibit A

IX. APPENDIX

The following claims are pending in the patent application:

1. An optical system, comprising:

a broadband source for providing a broadband optical signal; and

a chirped Bragg grating etalon, responsive to the broadband optical signal, for providing a chirped Bragg grating etalon optical signal having a precise set of optical reference signals.

2. An optical system according to claim 1, wherein the chirped Bragg grating etalon includes a pair of chirped Bragg gratings.

3. An optical system according to claim 2, wherein the precise set of the optical reference signals is determined by the spacing of the chirped Bragg gratings of the chirped Bragg grating etalon.

4. An optical system according to claim 1, wherein the precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broad optical source signal with the power at the beginning and end of the spectrum passed unaffected by the chirped Bragg grating etalon due to the limited bandwidth thereof.

5. An optical system according to claim 1, wherein the optical system further comprises an optical filter that responds to the chirped Bragg grating etalon optical signal, for providing an optical filter signal having the precise set of the optical reference signals.

6. An optical system according to claim 5, wherein the optical filter includes an optical bandpass filter.

7. An optical system according to claim 5, wherein the optical filter includes an additional Bragg grating.

8. An optical system according to claim 5, wherein the optical filter includes a long-period Bragg grating.

9. An optical system according to claim 5, wherein the optical filter includes a selective dielectric filter.

10. An optical system according to claim 9, wherein the selective dielectric filter is a Bragg grating.

11. An optical system according to claim 1, wherein the optical system further comprises an optical bandpass filter that responds to the chirped Bragg grating etalon optical signal, for providing an optical bandpass filter signal.

12. The optical system according to claim 1, further comprising:

an optical filter, responsive to the chirped Bragg grating etalon optical signal, for providing at least a portion of the precise set of the optical reference signals to an output port.

13. The optical system according to claim 12, further comprising:

an optical directional device for directing the chirped Bragg grating etalon optical signal to the optical filter, and directing the at least a portion of the precise set of the optical reference signals to the output port.

14. The optical system according to claim 13, wherein the optical directional device includes one of an optical circulator

and an optical coupler.

15. The optical system according to claim 12, wherein the optical filter includes a Bragg grating filter for reflecting the at least a portion of the precise set of the optical reference signals to an output port.

16. An optical source, comprising:

a broad band source that provides a broadband optical signal; and

an etalon including an optical waveguide having a pair of chirped Bragg gratings disposed therein, wherein the pair of chirped Bragg gratings are optically spaced a predetermined distance to provide a desired filter profile.

17. An optical source according to claim 16, wherein the desired filter profile includes a precise set of optical reference signals.

18. An optical source according to claim 17, wherein the precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source.

19. An optical source according to claim 18, wherein the broadband source has a spectrum and the power at the beginning and end of the spectrum is passed substantially unaffected by the etalon.

20. An optical source according to claim 1, wherein

the precise set of the optical reference signals includes a series of peaks covering most of a source spectral width of the broadband source; and

the broadband source has a spectrum and the power at the beginning and end of the spectrum is passed substantially unaffected by the chirped Bragg grating etalon.

Serial No.: 09/703,823

SERIAL NO. 09/703,823

Fiber Bragg Gratings

Fundamentals and Applications in Telecommunications and Sensing

Andreas Othonos
Kyriacos Kalli

Artech House
Boston • London

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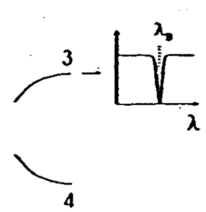
EXHIBIT A



in-fiber band-pass filter with arbitrary band-pass/stop-band combination can be successfully produced. This may be achieved either using UV post-fabrication techniques [99] or with a phase mask. Agrawal et al. [92] presented theoretical results on the insertion of multiple phase shifts (three π-phase-shift) equidistant along a fiber grating, resulting in three transmission peaks inside the stopband. As a further improvement to the operation of such devices as a band-pass filter, theoretical and experimental results on the introduction to a fiber Bragg grating of two π-phase-shifts located at optimized positions have been reported [100]. Although giving a wider and flattened band-pass peak, compared with the singly phase-shifted grating, the stop-band depth was not high enough for band-pass filter. The insertion of a third phase shift has been reported [101] giving a more rectangular band-pass shape while the increased phase-shift number allowed tailoring this rectangular spectral shape. Band-pass peaks with negligible ripples at the top (<0.01 dB) have been achieved through the optimization of distances between the phase shifts along the grating. These band-pass filters should find useful applications as noise filters or channel selectors in WDM systems.

6.5.6 Fabry-Perot Etalon Filters

Placing two identical Bragg gratings in series on a single-mode fiber results in a Fabry-Perot etalon within the fiber core. With the advancements in the inscription of Bragg gratings in optical fiber it is now possible to obtain etalons with finesse as high as several thousands. A simple filter application of the Fabry-Perot consists of an optical circulator and another fiber grating [102]. The input signal is filtered with a Fabry-Perot (grating pair) and directed forward to the fiber grating by an optical circulator. The reflected signal from the fiber Bragg grating is then redirected to the output port by the circulator. Although narrowband Bragg grating Fabry-Perot filters have been reported with very high finesse, for applications in short-pulse lasers and wideband communication systems, a response over several nanometers or more may be required with a wide variety of free spectral ranges needed. One technique to accomplish this is to use linear chirped gratings instead of constant period Bragg gratings [103]. Town et al. demonstrated this approach using a resonator formed with two linearly chirped gratings having reflectivities exceeding 50% over a 150-nm spectral width. The gratings in each pair were chirped in the same direction along the fiber axis. For lower vales of the free spectral range, the gratings were spatially separated; for higher values they were partially overlapped. This arrangement produced a resonator operating over a wavelength span exceeding 150 nm with a free spectral range value in the range 0.09–11.27 nm. These types of structures have been used to demonstrate CW multiwavelength operation of erbium-doped fiber lasers [9].

6.5.7 Comb and Superstructure Filters

The ability to permanently change the index of refraction in an optical fiber has proven to be extremely useful in the area of telecommunications and, in particular, in constructing

roduced by the sequential
at grating fringe patterns.
amplitude δn, with periods
the following form:

(6.21)

d $\Lambda_b = 2\Lambda_1\Lambda_2/(\Lambda_1-\Lambda_2)$. The
orm with a rapid variation
he fabrication of the moiré
ngs is accomplished either
g the writing wavelength
e <0.1 nm with associated
y Zhang et al. [89] that the
roadening of the stopband.
r band-pass and stop-band
ase in the stop-band width
iré filter [89].

l-pass filters and, as in the
ion filters within a narrow
e for most practical WDM
y the phase shift on broad
a result, a highly efficient